Evaluation of the variability of sediment and nutrient loading into San Antonio Bay

September 15, 2017

U.S. Geological Survey
Texas Water Science Center

Texas Water Development Board

USGS

Project Tasks

1. Collection of periodic water-quality samples.
2. Develop regression model to estimate suspended-sediment concentrations using backscatter signal from ADVM.
3. Develop a continuous record of suspended-sediment concentrations for period of gage operation and evaluate nutrient relations.
4. Evaluate historic flow data for the Guadalupe and San Antonio River below Victoria, Texas.

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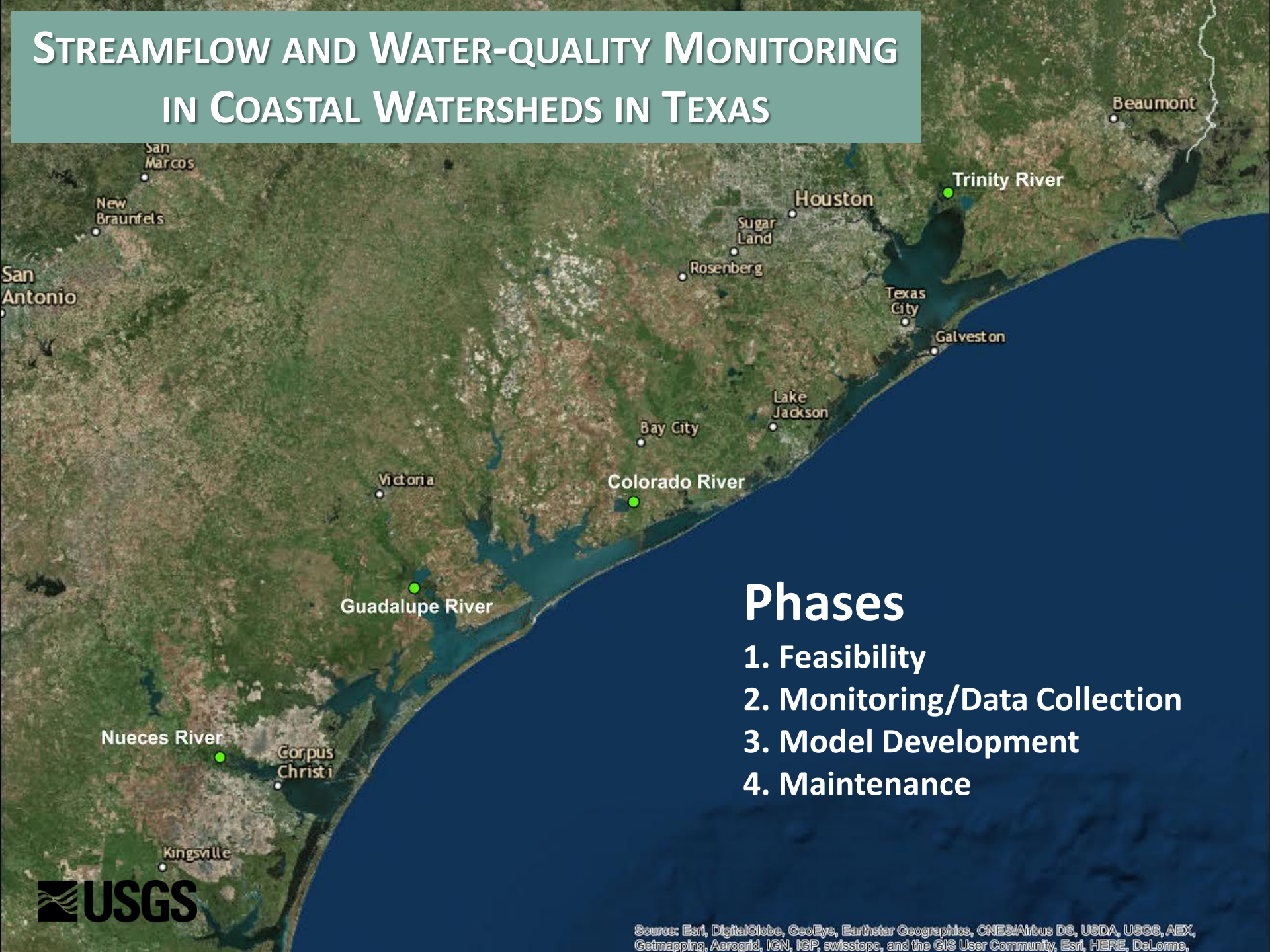
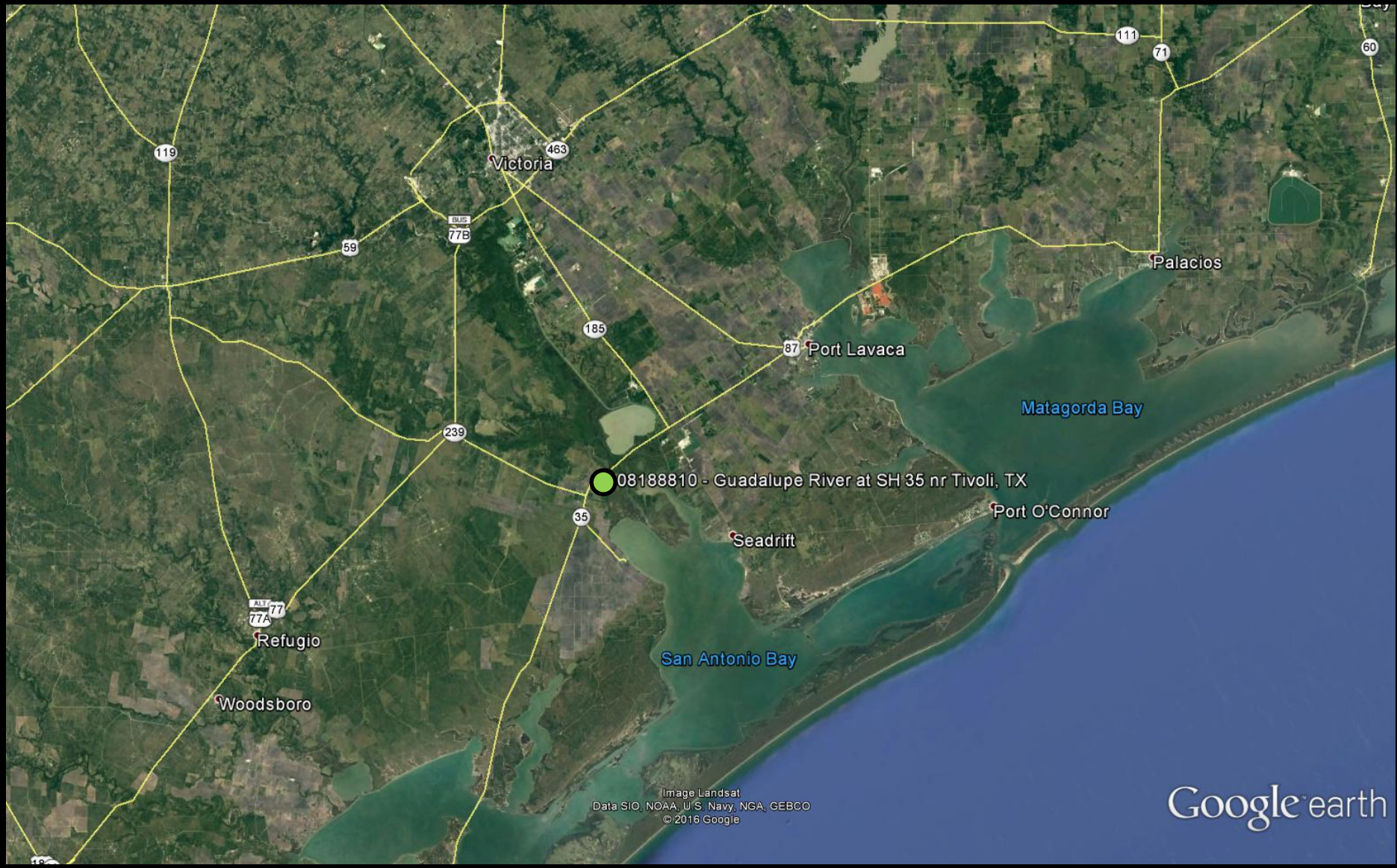
Streamflow and Water-quality Monitoring in Coastal Watersheds in Texas



Phases

1. Feasibility
2. Monitoring/Data Collection
3. Model Development
4. Maintenance


Victoria
Palacios
Port Lavaca
Matagorda Bay
08188810 - Guadalupe River at SH 35 nr Tivoli, TX
Port O'Connor
Seadrift
Refugio
San Antonio Bay
Woodsboro
119
463
59
77B
185
87
239
35
111
71
60
77A
77
Image Landsat
Data SIO, NOAA, U.S. Navy, NGA, GEBCO
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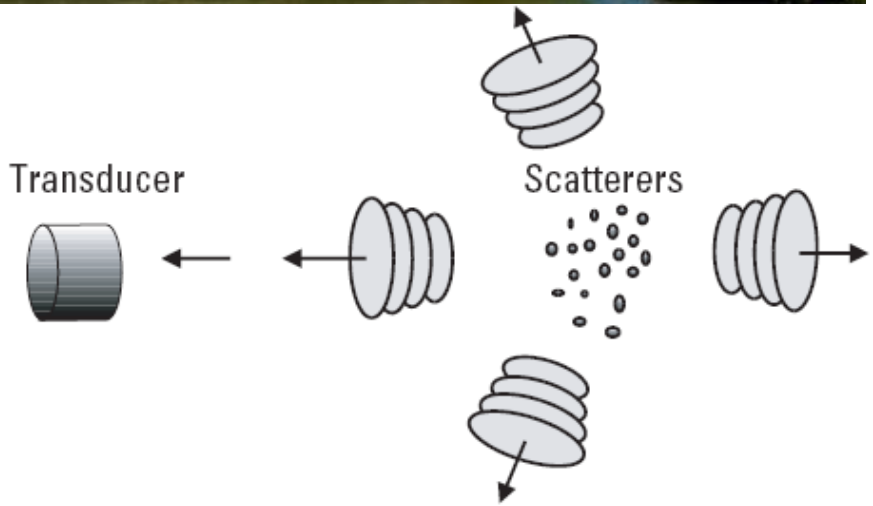
Google earth

Acoustic Backscatter

- Acoustic waves passing through a water-sediment mixture will scatter and attenuate as a function of fluid, sediment, and acoustic instrument characteristics.



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Data Collection

- Water-quality samples
  - Suspended-sediment
  - Nutrients, total and dissolved (N, P & C)
  - Physical water properties
- Concurrent and continuous acoustic backscatter data from ADVM

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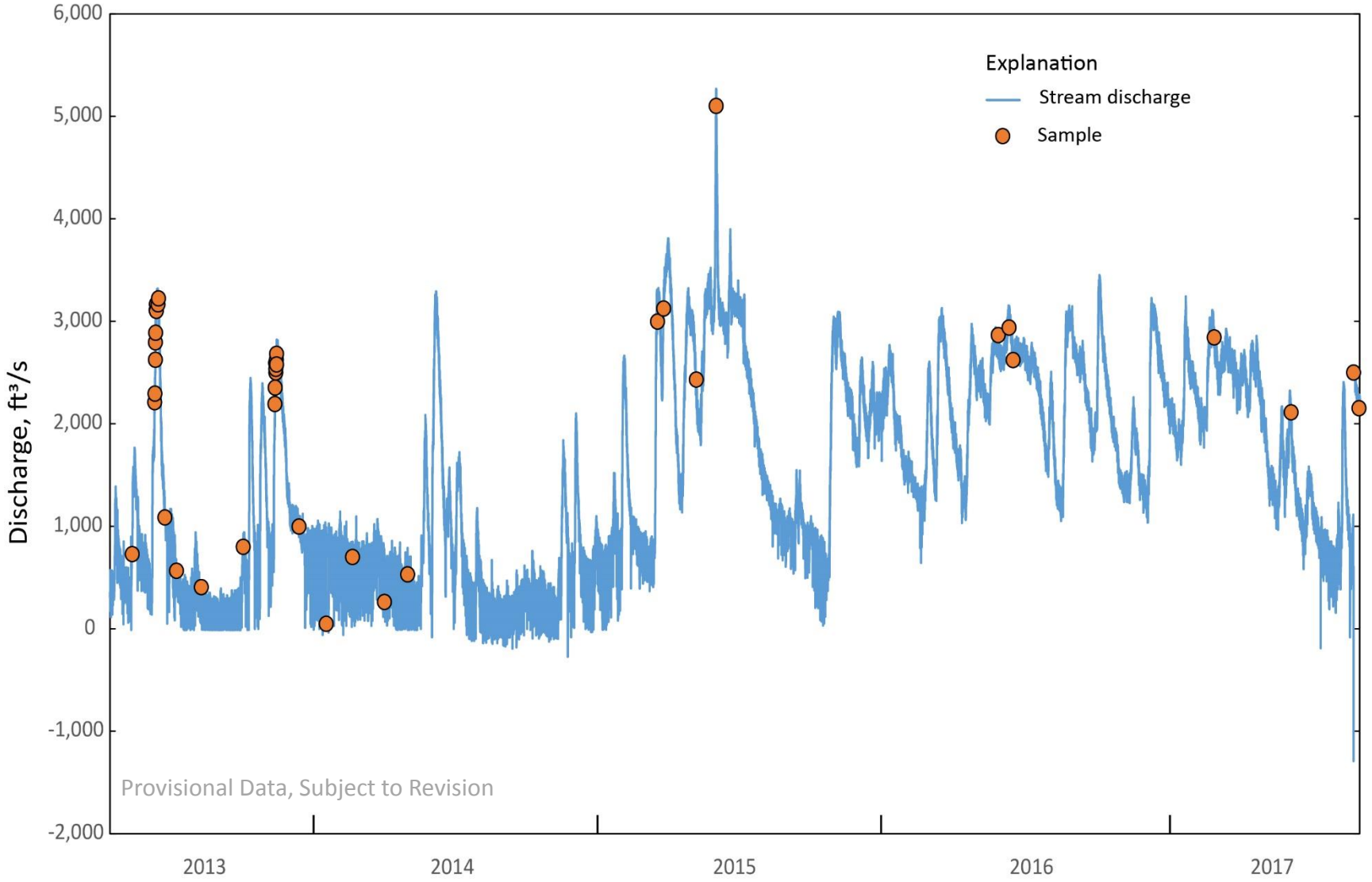
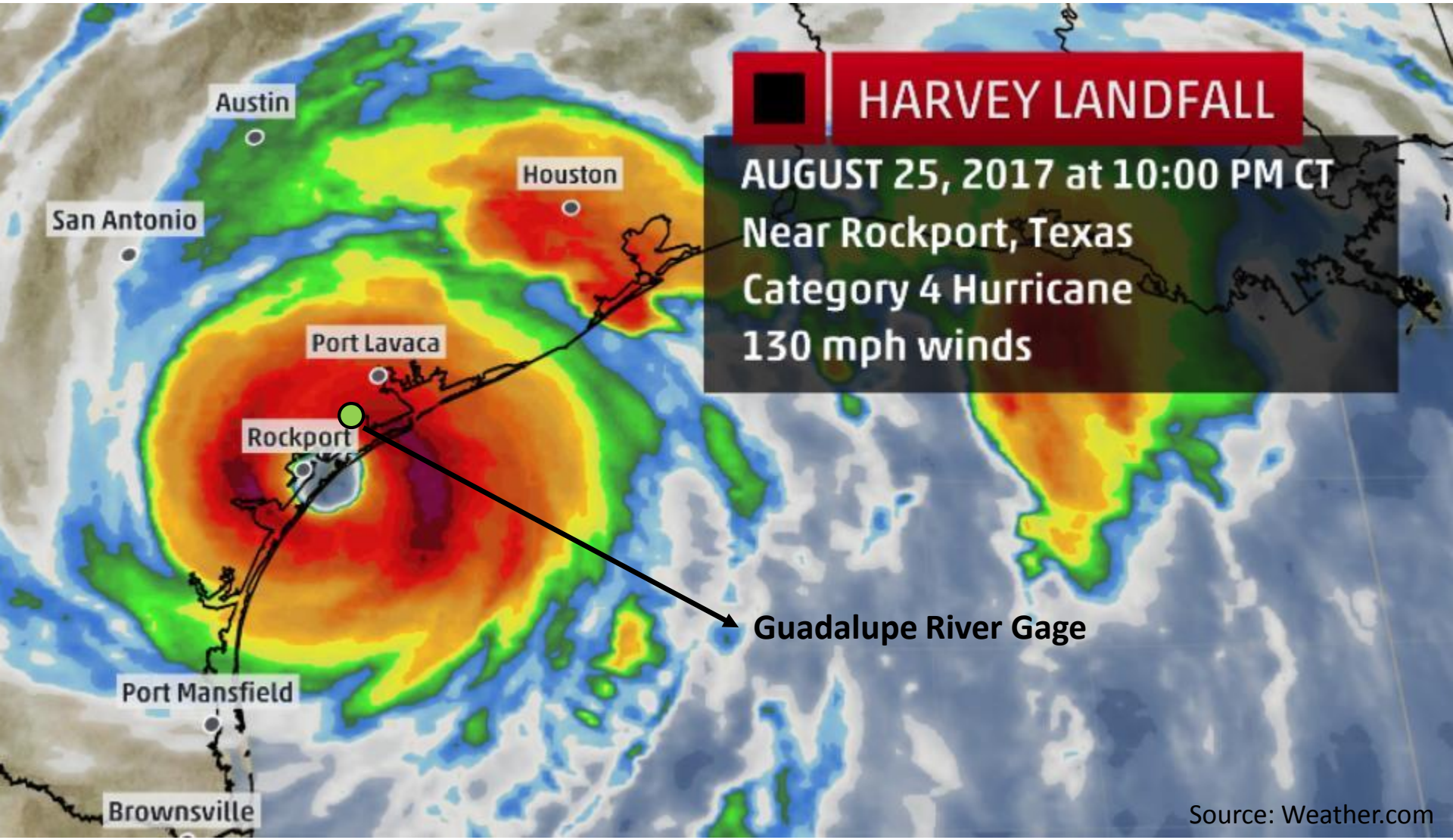
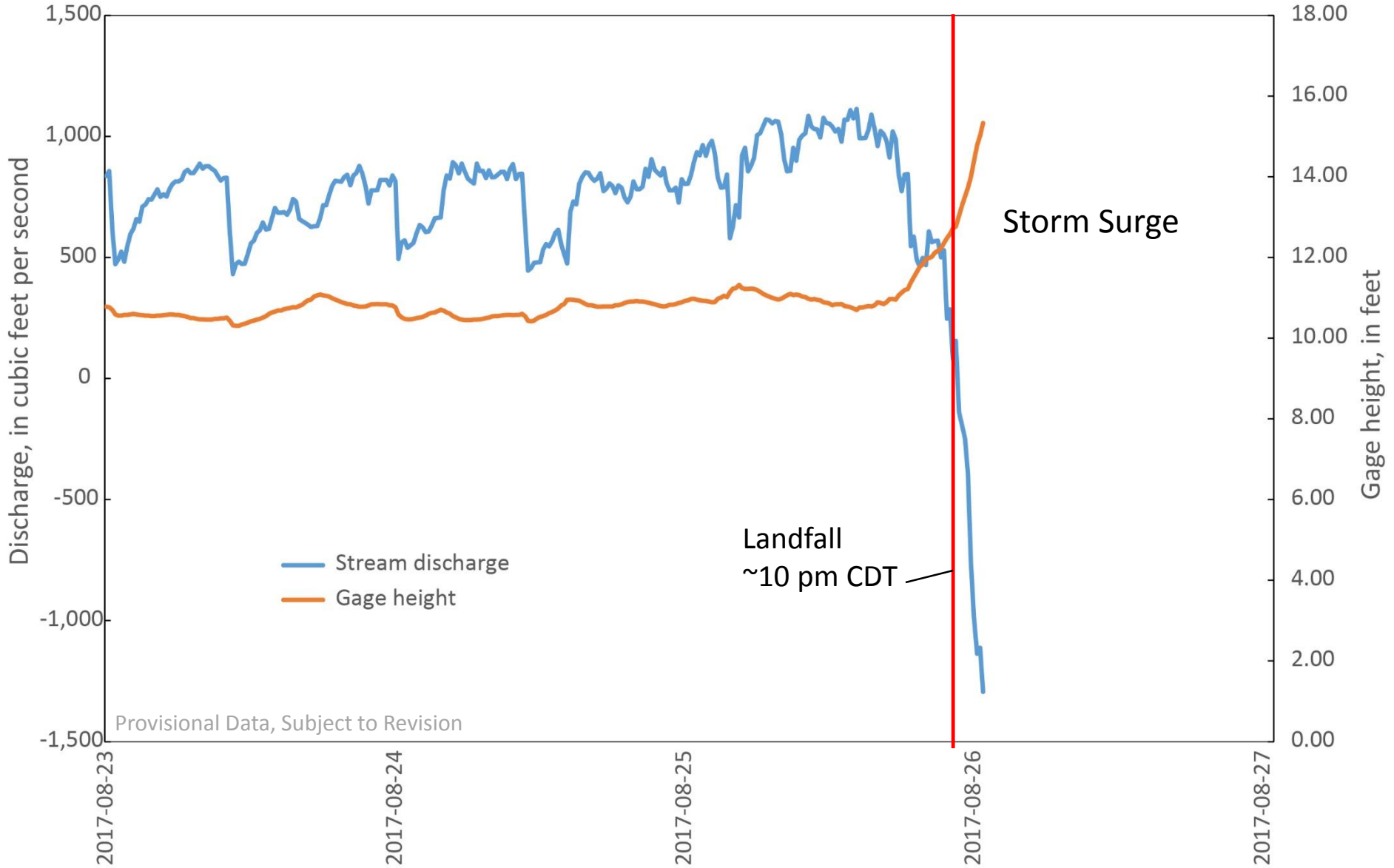
Sample Collection



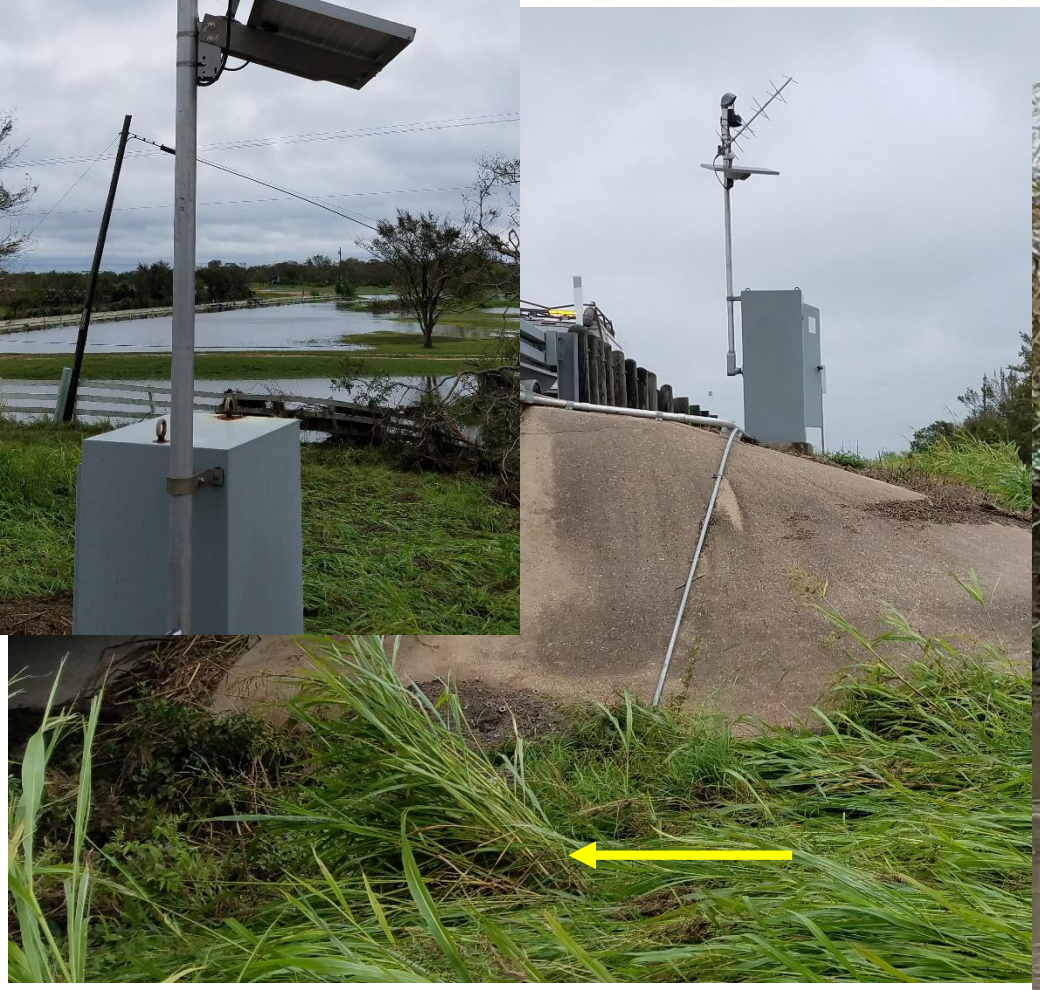
Hurricane Harvey



Hurricane Harvey



Guadalupe Gage Condition August 27, 2017



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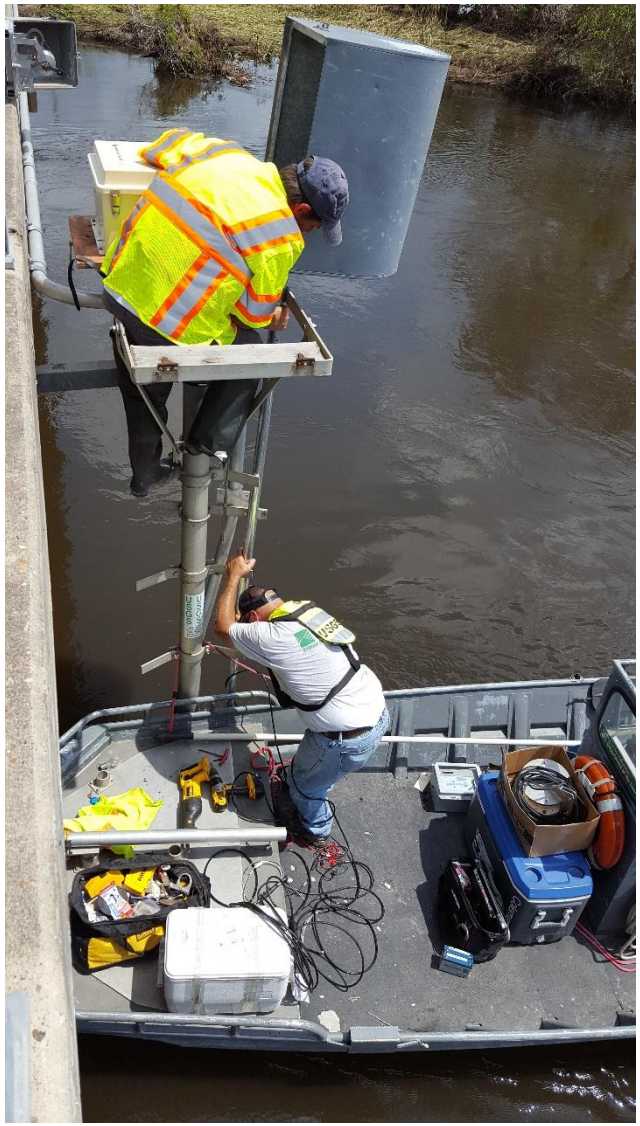
September 5, 2017
After flooding from inland rainfall



- Removed damaged pipe and ADVM
- Installed temporary ADVM (during sample collection)
- Repaired gage height equipment
- Collected water-quality sample
- Gage completely repaired on September 7, 2017

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Water Quality

- Smelled very strongly like decay
- Water was nearly black
- Dissolved oxygen was 0.3 mg/L
- Turbidity was 12.6 NTU
- Specific Conductance was 407 uS/cm

- No smell
- Water was brown from sediment load
- Dissolved oxygen was 3.03 mg/L
- Turbidity was 120 NTU
- Specific Conductance was 391 uS/cm

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Water Quality

- Smelled very strongly like decay
- Water was nearly black
- Dissolved oxygen was 0.3 mg/L
- Turbidity was 12.6 NTU
- Specific Conductance was 407 uS/cm

- Not much smell
- Water was less dark
- Dissolved oxygen was 4.24 mg/L
- Turbidity was 17.3 NTU
- Specific Conductance was 530 uS/cm

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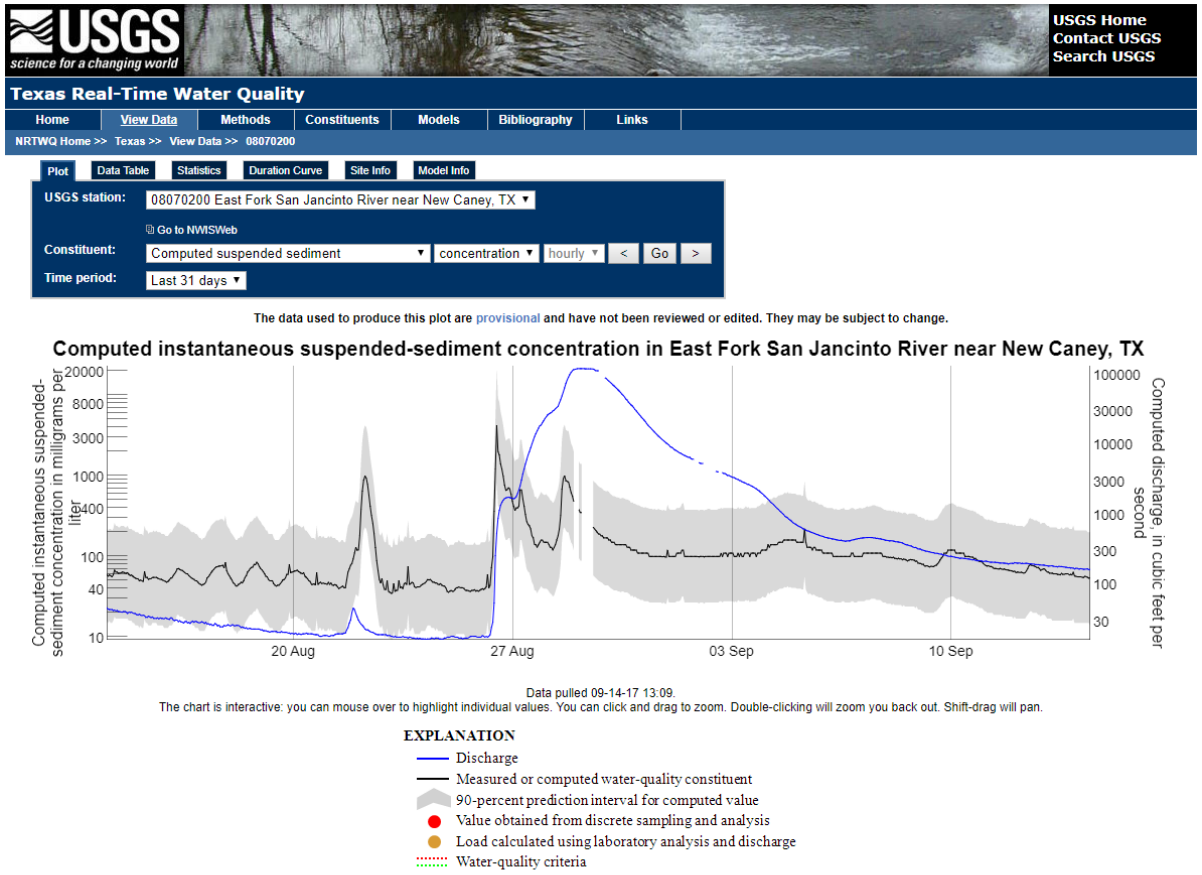
GUADALUPE RIVER MODEL

- Surrogate model is completed
- Next step - real-time SSC values on NRTWQ website
- USGS requires a Model Archive Summary (MAS)
- MAS must go through rigorous review process
  - Internal
  - External
  - Regional



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What's Next?

- Collection of more samples to expand and maintain surrogate model
- Publish real-time suspended-sediment concentration data on the web
- Evaluate potential surrogates for nutrient parameters
- Assess magnitude of unaccounted flow

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What's Next?

- Assess magnitude of unaccounted flow
  - Not practical/cost-effective to monitor all possible bayou overflows
  - Need to provide insight on separate contributions from Guadalupe and San Antonio Rivers upstream from the bayou reaches

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What's Next?

- Next scientific question: Provide insight on separate contributions from Guadalupe and San Antonio Rivers upstream from the bayou reaches
  - San Antonio River at Goliad
    - Already a long-term USGS discharge gage
    - 6-parameter QW monitor to be installed by another cooperator
  - Would like to leverage these existing resources
    - Add only collection of discrete suspended-sediment and nutrient samples
    - Use data to develop surrogate sediment model/real-time SSC from San Antonio River
  - Add collection of nitrogen and oxygen isotopes to determine potential nitrogen sources in both watersheds

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